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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 10/723,166 | 11/26/2003 | Raghav Raman | S02-272/US | 5735 |
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| LUMEN INTELLECTUAL PROPERTY SERVICES, INC. 2345 YALE STREET, 2ND FLOOR PALO ALTO, CA 94306 | | | EXAMINER BROOME, SAID A | |
| | | | ART UNIT | PAPER NUMBER |
| | | | 2671 | |

DATE MAILED: 11/04/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/723,166

Applicant(s)

RAMAN ET AL.

Examiner

Said Broome

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 November 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-19 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-19 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

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DETAILED ACTION

Information Disclosure Statement

The information disclosure statement filed 11/27/2002 fails to comply with 37 CFR 1.98(a)(2), which requires a legible copy of each cited foreign patent document; each non-patent literature publication or that portion which caused it to be listed; and all other information or that portion which caused it to be listed. It has been placed in the application file, but the information referred to therein has not been considered. The reference, "CT angiography with spiral CT and maximum intensity projection" Napel et al. 1992, was not readily available to the examiner and was not considered. However, all other references cited by the applicant were considered (see PTO-1449).

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-4 and 6-8 are rejected under 35 U.S.C. 102(e) as being anticipated by Parker et al. (US Patent 6,674,894).

Parker et al. describes a method for viewing a vessel in an image with a three-dimensional volume, as disclosed in the preamble of claim 1, in column 4 lines 1-13. Parker et al. describes the limitation of claim 1 in column 4 lines 36-48 where it describes determining adjacent points or boundary pairs in the view plane that are also described to define a vessel in column 11 lines 28-36. Parker et al. also describes determining at least one vessel-intensity for each boundary pair in column 11 lines 28-33 where it is described that the intensity of all neighboring points, or boundary pairs, are determined to be above the average background value, in which if the points are not above the average background value, then the neighboring points are included in the generated vessel as described in column 11 lines 33-36. Parker et al. also describes viewing in the projection plane along each projection path of the multi-dimensional image a plurality of adjacent points, or boundary pairs, in column 4 lines 36-48 and describes viewing the vessel intensities in column 11 lines 28-36.

Regarding claim 2, Parker et al. describes viewing and determining the context-intensity, or background intensity, in the area surrounding each boundary pair in column 11 lines 28-33 and 46-51 where it is described that the intensity of the area surrounding the neighboring points is determined and viewed on the screen for optional deletion by the user.

Regarding claim 3, Parker et al. describes fine-tuning the boundary pairs and vessel intensities in column 4 lines 14-17 where it is described that the image comprising the neighboring points and vessel intensities (column 11 lines 28-36) are refined by removing background regions such as bone or tissue to improve the image quality.

Regarding claim 4, Parker et al. describes filtering the boundary pairs in column 4 lines 22-25 where it is stated that the image comprising the vessel structure that is known to comprise the neighboring points, or boundary pairs, is filtered as described in column 11 lines 33-36.

Regarding claim 6, Parker et al. describes estimating boundary pairs, or neighboring points, using existing neighboring points to improve the connectivity of the vessels as described in column 10 lines 48-60.

Regarding claim 7, Parker et al. describes including a calcium region, or bone structure, located near boundary pairs in column 11 lines 39-51 where it is stated that the image data includes areas of bone, and at the users request, these areas are made available to be chosen for removal by users.

Regarding claim 8, Parker et al. describes excluding a bone region located near boundary pairs, which are points that comprise the vessel region, in column 11 lines 39-51 where it is described that a user is given the option to remove regions of bone surrounding the vessel from the image.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Parker et al. (US Patent 6,674,894).

Regarding claim 5, though Parker et al. does not specifically address a minimum boundary pair in case a boundary pair is close to zero, Parker et al. does describe a zero filled interpolation which is used to improve vessel continuity, as described in column 3 lines 23-33. Therefore it would have been obvious to one of ordinary skill in the art to improve the image quality and visibility of narrow or small areas of vessel structures through specifying a minimum boundary pair so as to provide continuous shape and connectivity of the vessel structure.

Claims 9-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Parker et al. (US Patent 6,674,894) in view of Frangi et al. (Model-based Quantitation of 3-D Magnetic Resonance Angiographic Images, 1999).

Parker et al. teaches all the limitations of claims 9-19 except for the limitation of claim 9, which describes selecting a starting point and an end-point encompassing the structure of interest in a plane of said image.

Regarding claim 9, Parker et al. describes a method for viewing a structure of interest, such as a vessel, in an image with a three-dimensional volume, as disclosed in the preamble, in column 4 lines 1-13. Parker et al. also teaches projecting a line in the view direction of the plane in column 4 lines 36-39. Parker et al. also teaches determining a boundary pair that defines the structure of interest along the line of projection in column 4 lines 36-48 where it describes determining adjacent points, or boundary pairs, in the view plane that are also described to define a vessel as described in column 11 lines 28-36. Parker et al. teaches determining an intensity for

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the structure of interest, or vessel, enclosed by the boundary pair in column 11 lines 28-33 where it is described that the intensity of all neighboring points, or boundary pairs, are determined to be above the average background value, in which if the points are not above the average background value then the neighboring points are included in the generated vessel as described in column 11 lines 33-36. Parker et al. also teaches determining the intensity for structures surrounded by the boundary pair in column 11 lines 28-36 where it is described that the intensities that are above the average background value are included in the background region which is described to include bone or tissue, as described in column 11 lines 46-51. Parker et al. does not explicitly teach the re-determining of the boundary pair, the re-determining of the intensity for the re-determined boundary pair and assigning the re-determined intensity and boundary pair to a pixel on the associated line, however it would have been obvious to one of ordinary skill in the art to re-determine the intensity values for each boundary pair to provide a more accurate representation of the vessel by repeatedly refining the shape and structure of the vessel through repeated calculation of the adjacent points comprising the vessel, which would also improve the quality of the pixels in each image frame during animation or sequential imaging of the frames. Again, Parker et al. does not teach selecting a starting point and an end-point encompassing said structure of interest in a plane of said image. Though Frangi et al. does not explicitly teach a starting-point and an end-point specifically, it would have been obvious to one of ordinary art, in regards to the points illustrated in Figure 4, to determine that the illustrated points would be analogous to a start-point and end-point encompassing the generated vessels, or structure of interest, in a plane of the image. It would have been obvious to one of ordinary skill in the art to combine the teachings of Parker et al. with Frangi et al. because this

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combination would provide points that define the starting and ending points corresponding to a specific vessel or structure of interest for interaction and analysis for a user.

Regarding claim 10, Parker et al. describes determining the context-intensity, or background intensity, in the area surrounding each boundary pair in column 11 lines 28-33 and 46-51 where it is described that the intensity of the area surrounding the neighboring points is determined and viewed on the screen for optional deletion by the user.

Regarding claim 11, Parker et al. describes filtering the boundary pairs in column 4 lines 22-25 where it is stated that the image comprising the vessel structure known to comprise the neighboring points, or boundary pairs, is filtered as described in column 11 lines 33-36.

Regarding claim 12, though Parker et al. does not specifically address a minimum boundary pair in case a boundary pair is close to zero, Parker et al. does describe a zero filled interpolation known in the art which is used to improve vessel continuity, therefore it would have been obvious to one of ordinary skill in the art to improve the image quality and visibility of narrow or small areas of vessel structures through specifying a minimum boundary pair so as to provide continuous shape and connectivity of the vessel structure, as described in column 3 lines 23-33.

Regarding claims 13 and 15, Parker et al. describes estimating boundary pairs, or neighboring points, using existing neighboring points to improve the connectivity of the vessels as described in column 10 lines 48-60.

Regarding claim 14, Parker et al. teaches the exclusion of one or more boundary pairs based on a threshold in column 10 lines 51-56 where it is described that boundary pairs, or neighboring points, are included in the vessel image if found below the threshold value, therefore

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neighboring points are also excluded based on the predetermined threshold if the neighboring points are determined to above the threshold value.

Regarding claim 16, Parker et al. describes including a calcium region, or bone structure, located near boundary pairs in column 11 lines 39-51 where it is stated that the image data includes areas of bone, and at the users request, these areas are made available to be chosen for removal by users.

Regarding claim 17, Parker et al. describes excluding a bone region located near boundary pairs, which comprise the vessel region, in column 11 lines 39-51 where it is described that a user may remove regions of bone surrounding the vessel from the image.

Regarding claim 18, Parker et al. describes a process of generating an animation viewing option of the structure of interest in column 7 lines 23-28, as described in the preamble. Parker et al. also describes defining a plurality of image projection planes in column 4 lines 64-67 and column 5 lines 1-5, and projection planes are also illustrated in Figure 18. Parker et al. also describes determining a plurality of boundary pairs, or adjacent points, which are points defining the structure of interest(column 11 lines 28-36) in the view plane associated with the projection plane in column 4 lines 36-45 where it is stated that each point along each projection path has a defined adjacent point in the image. Parker et al. also describes determining the intensity for the structure of interest, or vessel, associated with the boundary pairs in column 11 lines 28-36 where it is described that the intensities of the neighboring point are determined in order to generate the vessel structure. Parker et al. describes defining the view of the structure of interest based on the intensities of the boundary pairs in the projection plane in column 2 lines 58-63 where it is described that the maximum intensity projection selects the maximum intensity along

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each projection line, and defines the view of the structure of interest, or vessel as described in column 11 lines 28-36. The projection plane is described in column 4 lines 36-48 to contain the boundary pairs or, adjacent points, along each projection path. Parker et al. also describes sequencing through the plurality of projection planes in column 7 lines 23-28 where it is described that the image data may be viewed in an animation-type manner.

Regarding claim 19, Parker et al. describes viewing and determining the context-intensity, or background intensity, in the area surrounding each boundary pair in column 11 lines 28-33 and 46-51 where it is described that the intensity of the area surrounding the neighboring points is determined and viewed on the screen for optional deletion by the user.

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The other references listed on the attached PTO-892 form are made of record because they pertain to maximum intensity projections and angiographic imaging.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Said Broome whose telephone number is (571)272-2931. The examiner can normally be reached Monday-Friday between 8:30am-5pm.


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ulka Chauhan can be reached on (571)272-7782. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

S. Broome
10/27/2005

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